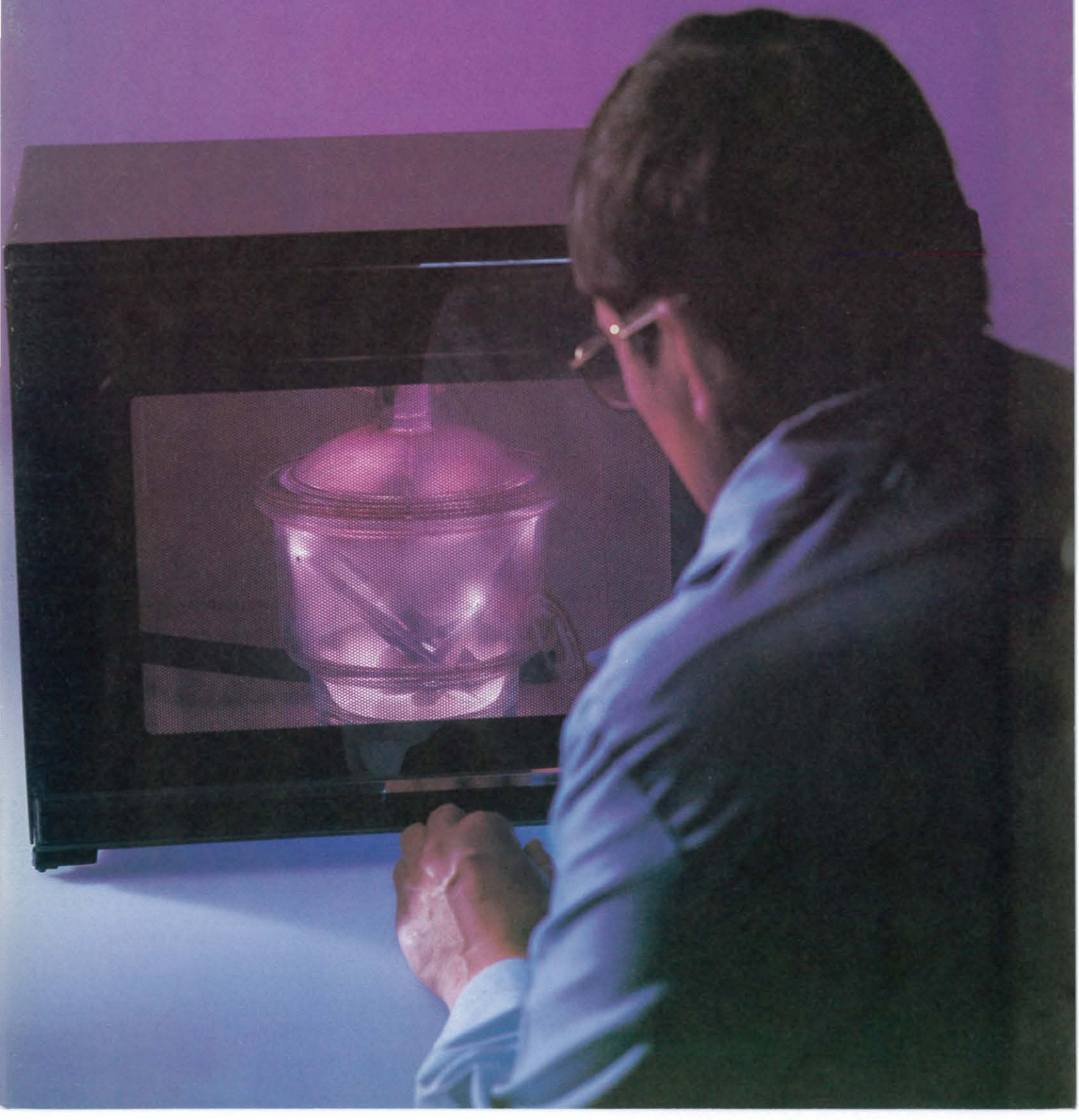
NAVY MEDICINE

September-October 1989



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COVER: Ghostlike plasma gas lights the inside of a vacuum jar during testing of a revolutionary sterilization system. Story on page 9. Photo by HMCS Larry Doonan and HM2 Bill Williams, NSHS, Bethesda, MD 20814.

Navy Medical Department
Guiding Principles

WE ARE the Medical Department of the United States Navy.

WE EXIST to ensure the best physical and mental health of the men and women of the United States Navy and Marine Corps.

WE WILL

Support the combat readiness of the Navy and Marine Corps.

Care for all persons as unique human beings worthy of our courtesy, compassion and respect.

Earn the trust and confidence of our patients by enthusiastically providing prompt access to quality health care.

Attend to the medical needs of the families of our active duty members, our retirees and their families, whenever we are able, for just as the family supports the force, so must we support the family.

Teach, for it is through education that we build the foundation for our future.

Continuously Improve in all aspects of our enterprise.

WE CARE for each other just as we care for our patients. This is the basis of the teamwork and trust that must exist for us to succeed.

WE ARE STANDING BY AND ARE ALWAYS READY TO ASSIST.

A look back: Navy medicine 1952

BUMED Archives

An HO3S-4 helicopter evacuates wounded from Korean battlefield to USS *Consolation* (AH-15). Note enclosed pod for carrying patient on helo's starboard side.

Change of Command

On 4 Aug 1989, the Naval Medical Command's change of command marked the end of NAVMEDCOM (Naval Medical Command) and the reestablishment of BUMED (Bureau of Medicine and Surgery) as the head of Navy medicine.

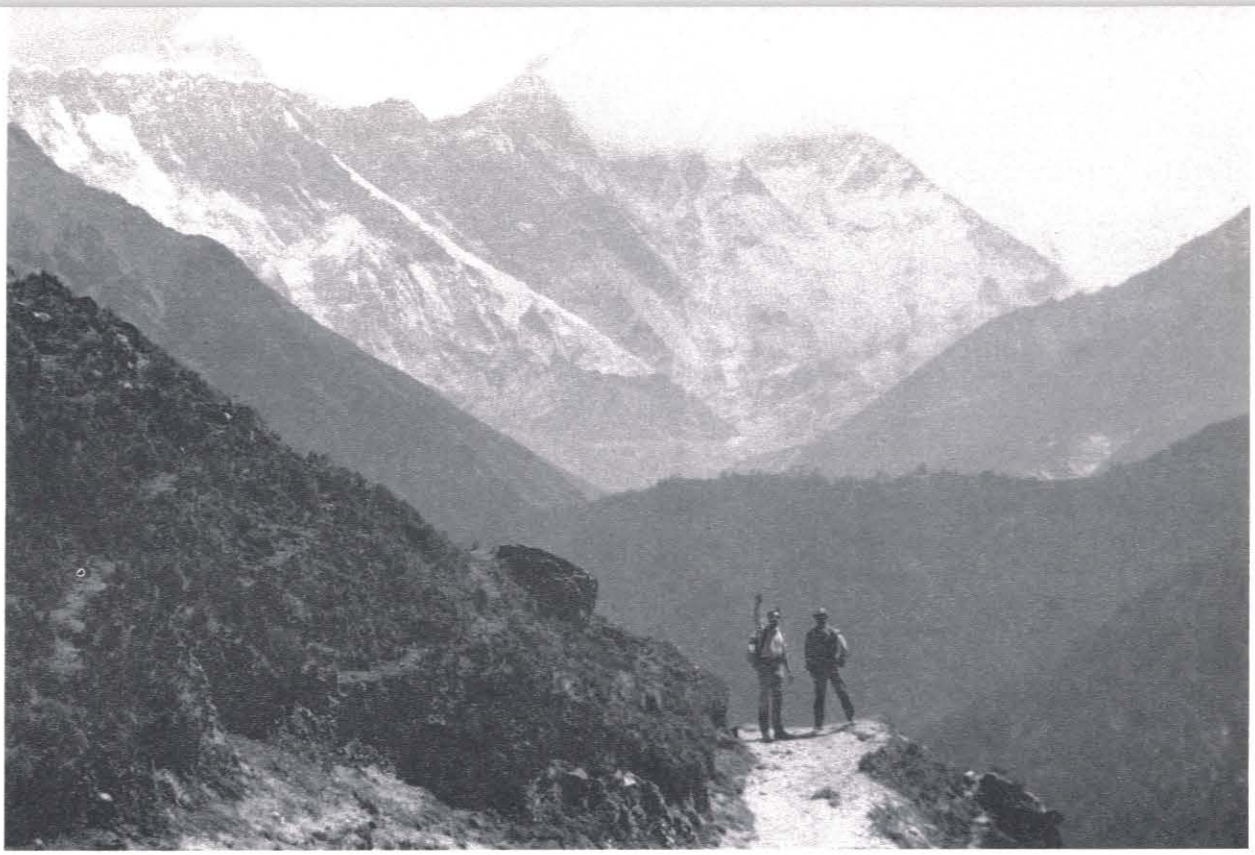
RADM H. James T. Sears, MC, Commander, Naval Medical Command, said farewell to a community and an organization he has served with honor and dedicated professionalism. "I love Navy medicine," said Sears. "It has been my life and my career for 25 years. I am sad to leave, but I am also full of pride in our history and our abilities. Most of all, I feel gratitude for the opportunities I have enjoyed and the outstanding people with whom I have had the honor to serve.

VADM James A. Zimble, MC, Surgeon General and now Chief, BUMED, presented Sears with the Legion of Merit, Gold Star in lieu of third award, and presented Mrs. Elsa Sears with a Certificate of Appreciation for her unfailing support and understanding during her husband's career.

VADM Donald L. Custis, MC (Ret.), former Surgeon General of the Navy, was the scheduled guest speaker, but was unable to attend the ceremony due to illness.

Photos by HM2 Tom Eichling

RADM Sears (left) and VADM Zimble



The two Navy doctors are dwarfed by the world's highest mountain.

Everest Adventure *Continued*

In a scientific adventure that took them to the top of the world, CDR Frank Butler, MC, and CDR David Harris, Jr., MC, finally opened their branch clinic at Mt. Everest (see *Navy Medicine,* May-June 1989). There the two ophthalmologists spent May researching the cause, incidence, and residual effect of high altitude retinal hemorrhages and other aspects of acute high altitude sickness.

They not only collected valuable data on a topic that few researchers have explored, but also got a taste of adventure on the trip as they entered a different world filled with unexpected delights, discoveries, and occasional dilemmas.

It was 5 a.m. the second morning in Kathmandu for Harris and Butler when they climbed aboard a small twin-engine plane that would fly them between mountains to the tiny village of Lukla, where they would begin an 8-day trek to the Everest base camp. Although the doctors realized there would be no grand airport or flight terminals in Lukla, they were in for a few surprises.

"It's a hillside, an uphill unpaved cow pasture," said Butler, describing the airstrip in Lukla, where they met their guides and new Sherpa friends, following the breathtaking flight between two mountains.

"The plane actually faces directly into the mountain when it takes off from Lukla. They have it designed on

the hillside this way to help the planes speed up when they take off and slow down when they land. But when there is no plane taking off there are cows walking around," he explained.

The two were welcomed by their Sirdar—the Sherpa guide to Everest, five Sherpa porters, and some Zohs (a hybrid between a cow and a yak) used for hauling additional equipment. Harris and Butler were amazed at the Sherpas' ease in hauling enormous weights of equipment on their backs for the journey. A task seemingly impossible came second nature to them, they observed.

"Their stamina and their strength is unbelievable. They carry more proportionally then anyone I've seen in the States. It's common to see people who weigh 100 pounds carrying a load of 120 pounds on their backs," Butler marveled.

In addition to witnessing their physical endurance, Harris and Butler were touched by the open, warm nature of the Nepalese people and pointed out how well the very different cultures blended together with a spirit of friendship.

The ophthalmologists traveled from Lukla to Nanche Bazaar, another community nestled in the foothills of Everest. Nanche Bazaar is not only the largest town with a population of 1,500, but also the only area with electricity in the Himalayan region.

Harris explained that many climbers stay in Nanche Bazaar for a few days before tackling the climb up Everest because they need to adjust to the altitude change to avoid illness. The high school children of Nanche Bazaar, however, have little difficulty with the altitude. They climb to the village of Kunde to attend school each day—a 4-mile hike up a 1,500-foot hill.

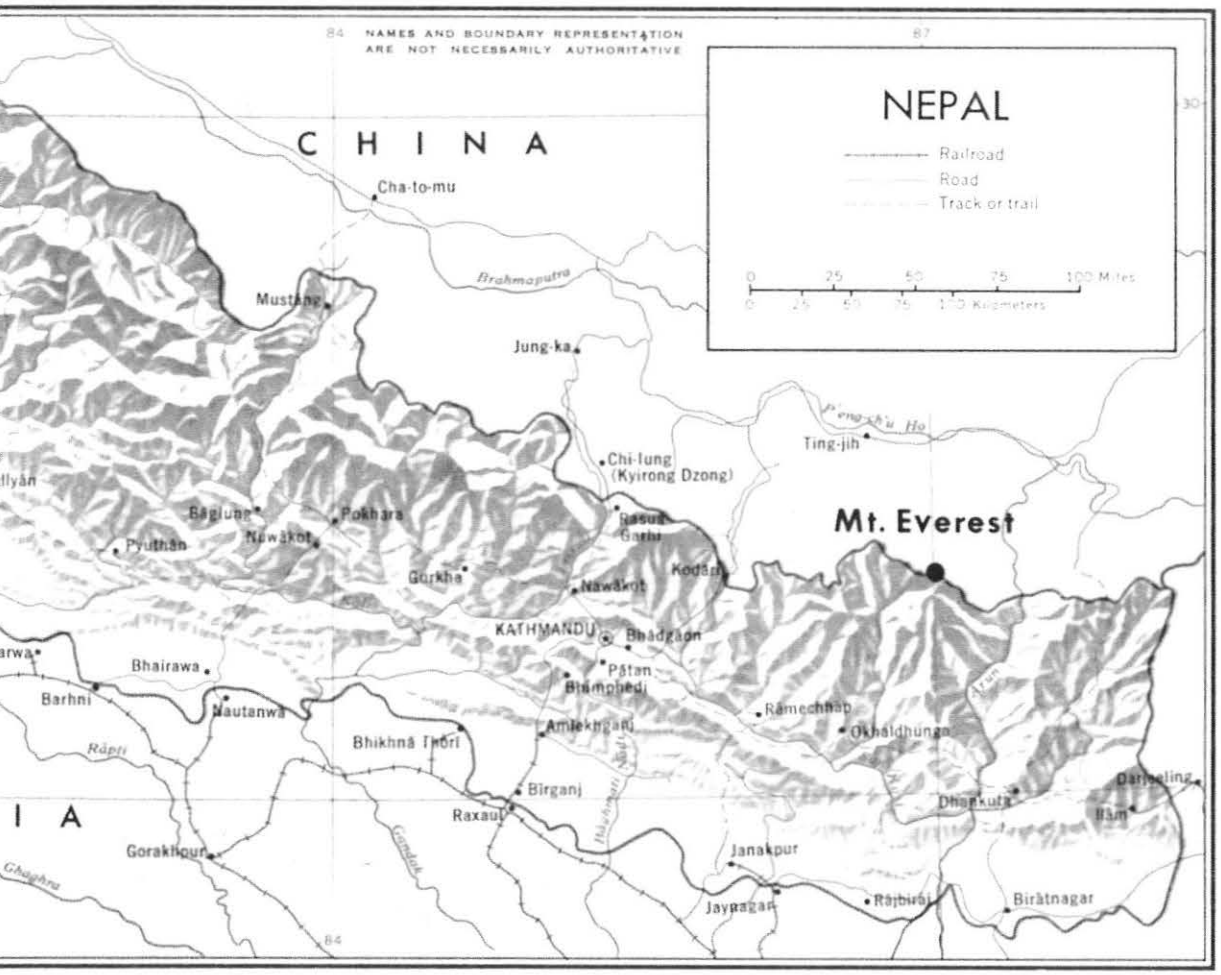
Also in Kunde is the sole medical facility in the region with a door open to a single operating room. In the small room doctors conduct cardiac surgery and, somewhat to the surprise of the researchers, encounter a high success rate with basic equipment.

Another surprise on the journey occurred when the ophthalmologists met Sir Edmund Hillary, the first person to reach the top of Mt. Everest. Hillary is now a New Zealand representative to Nepal and India. Butler and Harris said the 70-year-old gentleman, who still climbs some of the steepest hills on the Everest trail, took time to discuss NNMC (National Naval Medical Center), eye surgery, and mountain climbing with them.

"He's a good example of someone who, in addition to his personal accomplishments, has given something back to the region," Butler said.

The researchers hiked up narrow trails, crossed narrow wooden bridges draped over 150-foot gorges, and followed a very stiff traveling schedule, for the most part traveling a road that hundreds have lost their lives on.

"We passed hundreds of stone memorials called 'cairns' placed along



CDR Butler at work.

the ridges in honor of those who died on their way to the top of Everest," Butler said. He explained the road to Mt. Everest runs along the Dudh Khose River which climbers cross many times a day. "Although you may start out at 9,000 feet and end up at 11,000 feet at the end of the day, you go up and down many times and encounter different altitudes," he continued.

Even though the ophthalmologists were in excellent physical condition before the trip from rigorous workouts and running the steps of the 20-story Tower at NNMC daily, they both became ill while nearing base camp and each lost 25 pounds before the journey came to an end. Harris suffered from giardiasis and Butler was food-poisoned as they neared the base camp at 18,000 feet.

"It did not delay us but required us to hike at a slower pace with more breaks and made it difficult to eat. It accentuates the normal loss of appetite you have at such altitudes," Harris said, adding that most climbers are encouraged to follow a 7,000 calorie-per-day diet to combat energy and heat loss.

However, this was the only major snag in the journey. Once they met with their expedition members at base camp Harris and Butler got right to work. They provided eye and general medical care for more than 100 climbers from expeditions from throughout the world, collected data for their study, tried to keep warm and healthy, slept in small tents, and in their free time climbed huge crystal-like glacier formations to keep their blood flowing.

Base camp is 18,000 feet and the ophthalmologists did climb to 19,000 but did not attempt to reach the Everest summit at over 29,000 feet, which is only attempted by those with proper climbing expertise and a permit which allows them to do so.

"We examined a lot of patients outside of the study with acute eye problems and provided eye care for approximately 100 climbers and other Sherpas at base camp," Butler said explaining how eye exams became routine in a manmade stone building with a plastic, waterproof roof.

Harris said the two initially planned to examine eyes at nightfall to minimize discomfort from the glare on the glacier fields, but the cold temperatures—sometimes 15° F at night—made exams impossible as breaths in the cold air continually fogged equipment lenses.

In the small area Butler and Harris measured visual acuity, checked for distortions of central visual fields, measured intraocular pressure, examined retinas, recorded heart rates as well as blood and oxygen saturation, and photographed retinas with a special fundus camera. They were even equipped with a special backup power supply on loan to them from NASA to operate the fundus camera.

Additional data was collected to include altitude profiles, ocular symptoms, systemic symptoms, medications taken, and any illness experienced at the base camp or while on the expedition.

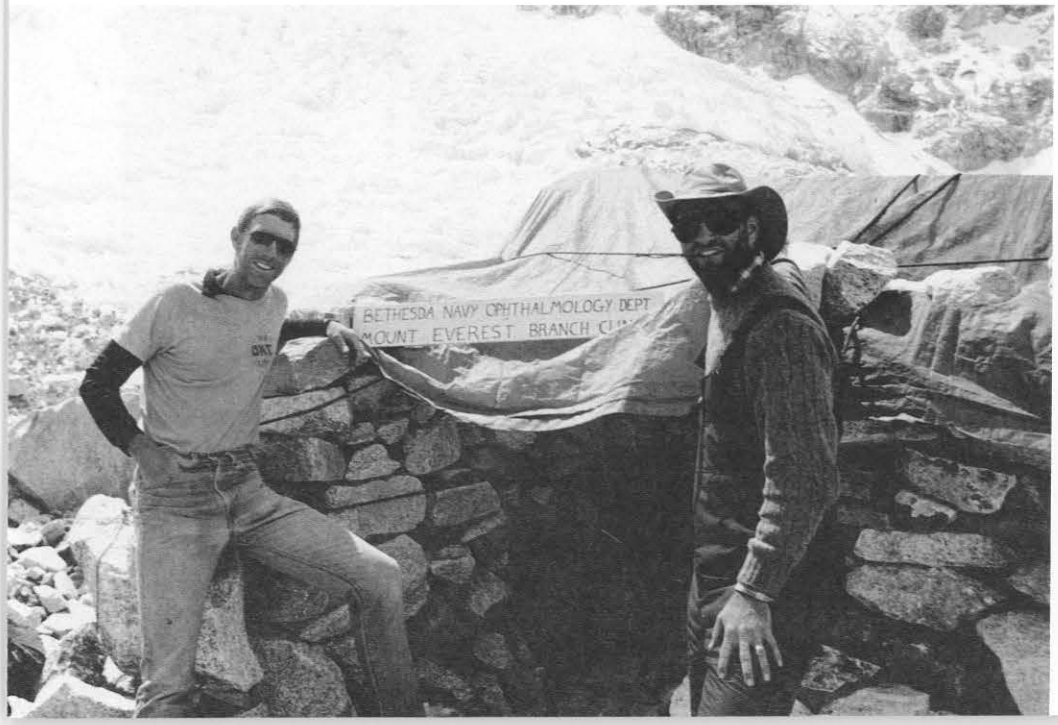
In the end, after gathering data, hiking the long trail down the mountain, and withstanding a 4-day plane takeoff delay in Lukla due to the beginning of monsoon season, Butler and Harris finally came home, happy with the outcome of the trip and safe return. Unfortunately, one of the Sherpa guides on their expedition was killed while on the Mt. Everest summit.

"There are numerous fatalities, and current news reports say five expeditioners from Poland were killed in an avalanche after we left. They chose a very challenging route to the summit that most people do not climb," Butler said.

Back at their normal routine at the NNMC Ophthalmology Clinic, the doctors have their work cut out for them preparing a report of their study. But they now have their own advice for researchers attempting this venture in the future along with stories from a month they will never forget. □

—Story by Kerry A. Gildea, Public Affairs Office, NNMC, Bethesda, MD. Photos by expedition members.

CDR Butler (left) and CDR Harris outside their clinic's front door.



Like Father, Like Son

Special care is given to crewmembers of USS *Okinawa* by father and son team, CAPT Bartley Cilento, Sr., and LT Bartley Cilento, Jr.

During a recent underway period, LT Bartley Cilento, Jr., medical officer aboard USS *Okinawa* (LPH-3), was afforded the opportunity to work hand-in-hand with his father, CAPT Bartley Cilento. This is the first time the father and son team have been able to work together since younger Cilento's commissioning.

Since being together aboard *Okinawa,* they've handled a medevac while transiting the Columbia River, after a crewmember nearly lost two of his fingers in a deck mishap. They have also done rounds together in the hospital ward.

"I requested to do my reserve active duty training aboard the USS *Okinawa* because I wanted to see how my son was doing, and do some operational medicine," CAPT Cilento said. "I also have a daughter who is a lieutenant in the Nurse Corps, stationed in Okinawa, Japan. And the unique opportunity to serve aboard USS *Okinawa* with my son was too good an opportunity to pass up."

Bartley, Sr. joined the Navy under the Ensign 1915 Program to help defray the high cost of medical school. After receiving his commission in 1960, he did his internship at Naval Hospital, Newport, RI. He then reported for duty to Naval Hospital, Chelsea, MA, to complete his residency. After successfully completing his residency, CAPT Cilento became a member of the staff at Naval Hospital, Jacksonville, FL.

CAPT Cilento has since become an active member of the Naval Reserve and operates his own pediatric practice in Scituate, MA. He is also the commanding officer of MED/DENT 0191 Naval Air Station, South Weymouth, MA.

Following in his father's footsteps, Bartley, Jr. joined the Navy in 1984 under the Health and Sciences Scholarship Program to help subsidize the cost of medical school during his medical education at Tufts University School of Medicine, Boston, MA.

LT Cilento received his commission from his father aboard USS *Constitution* in Boston Harbor. He then reported for duty to complete his internship at Naval Hospital, San Diego, CA.

"I grew up in a Navy family. Additionally, I spent most of my adolescent years in a small coastal town, Scituate, MA. My father was in the Navy, so being in the Navy wasn't anything new to me. I joined to save some money while going through medical school, but I also wanted to learn responsibility, and travel," Bartley, Jr. said.

After completing his tour aboard *Okinawa,* LT Cilento would like to join the Urology Residency Program at Naval Hospital, San Diego. □

—Story by JO3 Timothy Sibbel.

Gas Plasma Sterilization:
Innovation in Practice

CDR Maxwell H. Anderson, DC, USN

Sterilization is critical in all surgical interventions. This is particularly true in the dental operatory. The oral cavity harbors a multitude of microorganisms, some of which act as pathogens. The potential for transmission of pathogens between patients or to the dental treatment team mandates stringent asepsis.

The routine methods of sterilization in use today are autoclaving, dry heat, gas (ethylene oxide), radiation, and cold chemical sterilization. Each of these methods is effective but each has limitations. Limitations include extended time requirements, high temperatures, moisture, corrosion, and expense. There is a need for a low-temperature, rapid, dry sterilization system.

Gas plasma (glow discharge) sterilization is a new approach that can sterilize below 60°C in less than 30 seconds in a dry environment. Work carried out at the National Institute for Standards and Technology (NIST—formerly the Bureau of Standards) by Dr. Wald de Rijk, LCDR Lance Forsythe, DC,(*1,2*) and LCDR Mark Gilberts, DC,(*3*) has shown the efficacy of such a system.

Glow discharge sterilization involves the exposure of medical equipment or instruments to a highly ionized body of rarefied gas known as nonequilibrium gas plasma.(*4*) The idea of plasma sterilization is to expose microorganisms to the plasma for enough time to kill them without altering the material on which they reside. A low-temperature gas plasma can be created by using a partial vacuum (100-400 mtorr) in a radiolucent chamber in a radio frequency (RF) field.

Our research resulted from a conversation I had with Dr. John Tesk at NIST in July 1986. He wished to pursue a study in gas plasma sterilization but did not have the manpower. The Navy did have personnel that could perform the research. At the time I was a staff member in the Comprehensive Dentistry Residency program at the Naval Dental School, Bethesda, MD. Although we had several residents in need of research projects, we were without the 2,000-3,000 research dollars to buy a standard RF generator. In looking for inexpensive RF generators, we thought of trying a microwave oven. The frequency is in the RF range and regulated by the FCC at 2,450 MHz.

In the fall of 1986, LCDR Forsythe, one of our first-year residents in Comprehensive Dentistry, and Dr. de Rijk, a Ph.D. physicist and dentist from NIST, undertook the initial studies to determine the feasibility of generating a gas plasma in a microwave oven. We moved the Navy equipment to NIST to ease the logistics of the research. After a year of trials and materials selection, it was clear we could generate plasma in a microwave oven.

The usual arcing that takes place in microwave ovens containing ungrounded metal objects did not occur when we introduced metal instruments into the vacuum chamber and ignited a plasma. LCDR Forsythe and Dr. de Rijk then performed some preliminary studies on the ability of the plasma to kill test organisms on metal instruments. Their early efforts looked very encouraging compared to previous

The tips of these dental instruments glow as gas plasma generated by microwave oven does its work. A mere 30-second exposure will kill the *Bacillus subtilis* spore, one of the most resistant microbes known. (Photo by HMCS Larry Doonan and HM2 Bill Williams)

attempts to kill microbes with conventional RF frequencies(*5*) that took 15 minutes or longer. The microwave frequency (2,450 MHz) is much higher than conventional RF sources (13.6 MHz). This gives a micro-wavelength of 11.8 cm compared to a conventional wavelength of 22 meters. This shorter wavelength has more nodes and therefore a more rapidly varying electric field. These shorter micro-wavelengths (hence the name microwaves) create a discharge of excited atoms inside the rarefied gas (room air in this case).

The process is analogous to a neon sign, where light is created by neon gas plasma ignition. Maugh suspected the lethal element in gas plasma was singlet oxygen.(*5*) The improved killing effect on microbes seen by Drs. Forsythe and de Rijk may be caused by the increased ionization created by the shorter wavelengths. Other mechanisms of kill are also possible. We cannot rule out generation of a dense ultraviolet radiation field in the plasma.

In 1987, LCDR Gilberts undertook a follow-on study to determine the most effective pressure (vacuum) and exposure times for the microwave gas plasma process to kill test organisms seeded on dental burs. Drs. Gilberts and de Rijk, with the help of LCDR Brian Gray, DC, of the Naval Dental School's Research Department, used the sterilization test organism *Bacillus subtilis* spores as their test organism.

After 2 years of testing, they concluded that a microwave oven can produce a gas plasma that can consistently kill *Bacillus subtilis* spores on artificially contaminated burs during a 30-second exposure. They also showed that neither the microwave nor the vacuum alone explained the killing effect. Dr. Gilberts reported these results at the March 1989 meeting of the American Association for Dental Research in San Francisco, CA.

Interest in this process is now very high. We are truly excited about its possibilities. Because it is cool, dry, and rapid, it solves many of the problems of sterilization discussed at the beginning of this article. The potential applications of this technology are enormous. However, there are many unanswered questions to rejoin before a commercial product will be available. The Naval Dental School and NIST are proceeding with an organized research plan to answer those questions. We know we can sterilize metal surfaces but some materials are damaged by exposure with a microwave gas plasma. Paper, for instance, is charred when exposed to plasma yet unaffected by simple microwave exposure. We have to characterize which materials are affected and which are not. We are looking at the effects on metals of repeated exposures to the plasma.

In conjunction with Mr. Pat Riordan of the National Naval Medical Center Laboratory Medicine Department, Bethesda, we have begun research into the ultrastructural effects on microorganisms. Others are looking at simple ways of testing such a system for sterilization efficacy. Our tests involved the handling of spore state organisms and time-consuming microbiological culture techniques. Conventional sterilization tests are ineffective because they use sealed systems that deny plasma access to the organisms or are impregnated in paper which chars. NIST and its Plasma Physics Department are characterizing the plasma in an effort to determine why it is so much more lethal than conventional RF plasma. Once the cidal properties are identified, they will design systems for maximum efficacy.

Surgeon General of the Navy VADM James A. Zimble, MC,(*6,7*) and former Commander, Naval Medical Command RADM H. James T. Sears, MC (Ret.), have called on us for innovation(*8*) in solving today's problems. If the scientific community and industry can fully develop this innovation, it will revolutionize the state of the art of sterilization. Gas plasma provides the potential for an inexpensive, reliable, and rapid method of low-temperature sterilization. It would also mean significant monetary savings in sterilization and related areas. The number of metallic instruments required for surgical setups could be reduced because the turnover time would be less than 1 minute. A dropped instrument in the operating room could be retrieved and sterilized on the spot. Labs could prepare sterile culture plates in less than 1 minute rather than using time consuming and costly ethylene oxide sterilization. System portability for remote units would be far easier. Ships would have less use of their steam sterilizers thus reducing the potential for personnel injury, maintenance costs, and air-conditioning loads. The list of uses seems endless.

It is pleasing to have been the staff research mentor on these projects. This work was supported by NMRDC work number M0095-06-3014 and in part by NIDR Interagency Agreement Y01-De 30001. It is rewarding to see the Navy's research dollars so well spent and the cooperation afforded us by Dr. Tesk's group at NIST.

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Dr. Anderson is assigned to the Naval Dental School, Bethesda, MD 20814.

Highlights From the Navy Medical Research and Development Command

Bethesda, MD

• Hepatitis B in Navy Personnel: New Trends

Investigators at the Naval Medical Research Institute, Bethesda, MD, have recently completed an extensive epidemiological study of hepatitis B infections in Navy personnel. This multiyear investigation demonstrated that a dramatic decline in hepatitis B infections was associated with the initiation of the Navy's drug abuse program, providing an additional benefit to a drug-free Navy.

The study also showed that patients with sexually transmitted diseases (STD) were at increased risk for hepatitis B infection. The Navy Medical Department is currently assessing whether STD patients should be considered a high-risk group and be vaccinated with hepatitis B vaccine.

* * *

• A New Wound Dressing Enhances the Repair of Large Combat Wounds

Supported by an NMRDC contract, investigators at the Oregon Health Sciences University, Portland, OR, have developed a collagen-based, pourable wound dressing for the emergency management of combat wounds. This liquid dressing is formulated to cross-link upon contact with the wound surface, producing a protective gel to cover the entire wound area and to deliver both hemostatic agents and bactericidal drugs. Unlike conventional wound coverings, the collagen gel does not have to be removed prior to skin grafting, but instead, provides an improved bed for the graft by forming a matrix for the ingrowth of fibroblasts and capillaries. Tissue regrowth may be augmented by impregnating the gel with some of the recently described growth factors. The dressings can be freeze-dried and stored at room temperature, providing a long shelf life for shipboard and field use.

• Electromagnetic Radiation (EMR) Shown to Warm Navy Personnel

The requirement for divers and other Navy personnel to work long hours in cold, wet environments commonly results in discomfort in the extremities, reduced manual dexterity, and limited operational performance. Researchers at the Naval Aerospace Medical Research Laboratory, Pensacola, FL, have recently developed two prototype EMR coil systems to warm either the chilled hands or feet of human research volunteers. Subjects tested with these devices experienced temperature increases of 1.5° C to 4.0° C in their irradiated tissues, reporting a pleasing sensation of warmth with no undesirable side effects. NAVSEA and the Navy diving community both have expressed significant interest in these EMR warming devices, which will undergo further testing and development this coming year.

* * *

• Research Intensive Care Unit Established in Indonesia

Investigators at the Naval Medical Research Unit No. 2 Detachment, Jakarta, Indonesia, in a cooperative effort with the Indonesian Ministry of Health, have completed the establishment of a state-of-the-art, clinical research ICU at the University of Indonesia Hospital in Jakarta. With a goal of developing effective, life-saving therapies for infectious/hemorrhagic shock, this critical care unit will study the hemodynamic parameters of shock, including computerized monitoring of cardiac output, peripheral vascular resistance, pulmonary wedge pressure, and intra-arterial pressure. The first disease to be investigated in this new research unit is dengue virus shock syndrome, as dengue virus infection represents a serious threat to the Navy's operational forces.

For additional information on these or other medical R&D projects, contact NMRDC Code 40 at Commercial (202) 295-1468 or Autovon 295-1468.

The potential for diminished air superiority in future conflicts may preclude the widespread use of medevac helicopters we came to rely on in Korea and Vietnam.

Let's Get Realistic About Medical Preparedness for War

CAPT Arthur M. Smith, MC, USNR-R

Although readiness for war can be defined in many ways, and its costs calculated by equally variable means, the most fundamental and compelling question facing Navy leadership is, "Can we afford *not* to be ready?" Most physicians and other health care personnel with combat experience recognize that medical support issues in wartime are no abstraction. Bleeding sailors and marines are not equivalent to ration boxes and cannot be dealt with by abstract logistics formulae and equations. The goal of the whole process, which is incorporated under the mantle of "military medicine," is to salvage those who are salvageable. Without training to render the specialized type of care required by casualties of war, the salvageable become expendable.

No greater inheritance can we bequeath to future generations of sailors and marines than the assurance that Navy medicine will stand ready to support them whenever they undertake personal risks in our nation's service. This commitment to our constituency must include a dedicated resolution to institutionalize competence in treating the diseases and injuries uniquely identified with the combat environment. *This can best be accomplished by dedicated attention to the art and science of military medicine and surgery.* How well have we done in emphasizing the distinction between military medicine and the practice of peacetime medicine in the military setting?

After action reports concerning medical support of the Inchon amphibious operation in Korea noted, "The abruptness of the Korean crisis, and the haste in which mobilization was executed, precluded any preconceived criteria for training and preparation of the elements of the pioneer First Medical Battalion supporting the First Marine Division. Perhaps the greatest problem experienced by the organization was the paucity of medi-

Photos from BUMED Archives

cal officers with more than elementary surgical experience. This was particularly felt with regard to the treatment and sorting of battle casualties.

Many of the young medical officers required supervision in the proper handling of wounds. This imposed undue burden on the few more experienced officers who were often occupied with more complicated problems." The report continued, "It was found that inexperienced medical officers, under the pressure of receiving overwhelming numbers of severely

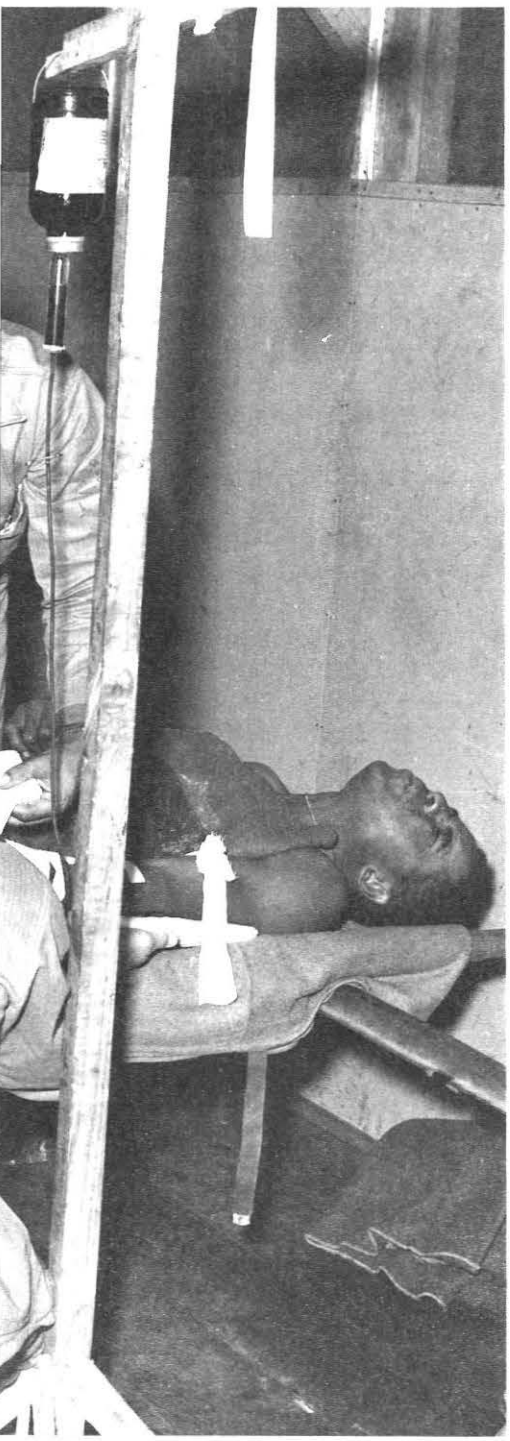
When in a future war helicopters can no longer roam unfettered, we will lose the ability to evacuate the casualty immediately upon wounding.

In Korea, it was found that inexperienced medical officers, under the pressure of receiving overwhelming numbers of severely wounded patients, were rapidly reduced to a state of ineffectiveness.

wounded patients, were rapidly reduced to a state of ineffectiveness. This was characterized by aimless wandering around the litters, reading emergency tags at random, and palpating abdomens and extremities here and there, without rendering treatment or making a decision."(*1*)

RADM Ben Eiseman, MC, USNR (Ret.), a veteran combat surgeon, noted, "Throughout their training, medical students are imbued with the principle not to compromise patient care. Nothing less than excellence is to

be tolerated but, suddenly, in a combat situation, compromise becomes necessary. The reaction of such a highly programmed physician is predictable: he becomes outraged, frustrated and resentful . . . . In the comparative luxury of the Vietnam war, many medical officers were shocked by the occasional need to change the pattern of patient care from that which they practiced in civilian life. Physicians are a rigid compulsive tribe and, in many cases, the cultural, professional, and emotional shock of having to compromise patient care actually immobilized or rendered unfit the physician suddenly placed in a combat zone."(*2*)



Wounded marine is prepped for surgery in Korea.

Why Military Medicine is Different

There is a great difference between practicing medicine in the military setting and "military medicine." There exists a distinct and fundamental body of knowledge specific to military medicine which is unique to military practice and not translatable from the civilian setting. It must be thoroughly understood by *all* those responsible for the sick and wounded in wartime, whether they be active duty or reserve.

The spectrum of diseases differs from that seen in the peacetime domestic setting. For example, parasitic, fly, tick, chigger, louse, and mosquito-borne diseases—many now drug resistent—are well known to our operational military medical colleagues around the globe. This has prompted some to state, "In war, the mosquito is more powerful than the mortar round." Add to this list the various viral hemorrhagic fevers, diarrheal diseases, and the ubiquitous hepatitis virus, and one can readily understand why these conditions, collectively, have previously brought many powerful armies to their knees.

The spectrum of injuries is also different in the sphere of military medicine. Without question, these differ from the wounds seen in civilian life from the perspective of the multiplicity of wounds in any given individual, as well as the magnitude of injury. With developing weapons of increasing lethality, the potential exists for these differences to grow even greater.

The military medicine specialist must recognize the unique wounding characteristics of high velocity bullets, shrapnel, mines, fleshettes (we have multiple forms of munitions, each containing thousands of razor-sharp, arrow-shaped "fleshettes" that emanate from the shell casing in a cone or beehive-shaped mass, traveling at high speed for several thousand meters), as well as other types of "improved fragmentation munitions (cluster bombs)" containing large quantities of preformed fragments designed for their optimal ballistic and wounding characteristics.

Burns are also a common form of injury. The spectrum of burns in the military setting is also different from that seen by civilian physicians. The uniqueness of etiology, and the differing treatment requirements of burns from napalm, incendiaries, flame munitions, and white phosphorus must be recognized by military medical specialists.

Other mechanisms of injury are also heavily confined to the military spectrum. Blast injuries, for example, are a phenomenon more akin to the milieu of military medical practice than elsewhere. The effects of fuel-air explosives, with the induction of major "blast lung" trauma are common military injuries, many of them ultimately fatal. Similarly in the Navy, the injurious effects of underwater immersion blast upon both the lungs and abdominal viscera must be well understood. Crush injuries also occur in greater abundance in the military setting, and the implications of such forms of trauma for the many surgical and medical disciplines involved in their care are significant. Inhalation injuries from the results of ammunition and plastics combustion, particulate metal aerosols (such as fine brass particles for clouding electromagnetic transmissions), rocket fuel combustion fumes, and environmental obscurants such as picric acid and anthracene, are also indigenous to the modern battlefield. Evolving technology will also favor directed energy weapons in the future, such as laser-charged particle beams and high-power microwaves. The full extent of their wounding potential is yet to be determined.

All these implements of major soft tissue and bone destruction are

exercised in a setting which contributes to massive contamination of wounds, massive blood loss, and major fluid imbalances. These create major challenges for military surgeons, anesthesiologists, and internal medicine specialists alike. Concomitantly, these examples of multisystem trauma are often experienced in the setting of environmental adversity, such as desert, arctic, high altitude, and chemical warfare environments.

Indeed, who else but a military specialist can appreciate the combined influence of these major injuries and environmental effects upon the administration of anesthesia, the survivability from routine injuries, and basic wound healing? For example, who else will be the first called upon to manage pain in the setting of chemical warfare? Who else will have to determine the effects of the chemically contaminated environment upon the administration of anesthetic agents (both of which affect the same autonomic nervous system)?

In addition, who else is challenged to integrate his professional judgment with the reality that medical care in the combat setting is managed in an echeloned fashion? Medical treatments are carried out variably and in stages. These are dependent upon types of facilities available, elapsed time since injury, and expected time in transit to the next higher echelon facility. In addition, consideration must occasionally be given to the pressing need to bypass treatment of some injuries in order to render attention to other casualties with more life-threatening needs during casualty overload situations.

Operational realities also abound in military medicine. Injuries occur in various settings where complicated and dangerous extrication requirements exist, such as within the confined spaces of tanks, aboard ships and submarines, and often amidst smoke, fire, and adjacent exploding ordnance. Occasionally, care must also be rendered under conditions of threatening hostile fire, limited transportation availabilities, limited supplies, austere treatment facilities, and in geographic settings far removed from the availability of sophisticated medical consultation.

Tactical requirements similarly affect medical care delivery. For example, in the operational doctrine now being promulgated by the Marine Corps, known as over-the-horizon warfare, ships of the amphibious task force, including casualty receiving and treatment ships, may now be obligated to remain 50 or more miles offshore. Due to the accuracy of enemy weapons and the need for tactical dispersion, medical support units ashore may also be widely dispersed. Hospital ships, due to the significant threat from indiscriminant missile warfare, may also be required to remain far offshore.

Given the reasonable potential for diminished air superiority, compared to that which we enjoyed in Vietnam, the strong possibility exists that the wounded may experience inordinate delays prior to receiving any initial medical care, much less any more care beyond buddy first aid, or if fortunate enough, perhaps assistance from a beleaguered corpsman, himself under fire. The delays inherent in such circumstances imply that many wounded, whose injuries allow them to survive the protracted time lag, will eventually arrive at medical facilities with major physiological depletion and heavily contaminated and infected wounds. These realities present a significantly complex dimension to the care of those who might have originally presented as relatively light and nonlife-threatening injuries. These realities are also within the purview of the military medical specialist.

Training Implications in Military Medicine

Unfortunately, today, the illusion that everyone in future conflicts will be conveniently delivered by helicopter to a high tech fleet hospital, just as automobile accidents in the peacetime domestic setting are brought to trauma hospitals, has led to heavy emphasis upon implementation of civilian-based training packages. These include Advanced Cardiac Life Support (ACLS) for the management of heart problems and Advanced Trauma Life Support (ATLS), an excellent training program for management of civilian injuries in the early stages. (The latter are primarily blunt injuries and breathing—airway—problems, both of which are not common among the wounded in war.)

Marines storm ashore at Inchon.

A recent article published in the *Journal of Trauma* underlines the problem of attempting to superimpose civilian treatment standards upon the combat setting. Currently accepted civilian guidelines regarding any suspected neck injury suggest that immobilization of the neck be performed immediately. In a controlled civilian environment, this is entirely appropriate since such injuries are regularly seen and, if improperly managed initially, can lead to paralysis or death. What, however, are the risks and benefits to be gained when this rule is exercised in a hazardous environment such as the battlefield?

There exists a distinct and fundamental body of knowledge specific to military medicine which is unique to military practice and not translatable from the civilian setting.

Data accumulated from casualty studies in Vietnam clearly demonstrated that penetrating injury of the spinal cord in the neck was commonly fatal and, most often, immediately. Only 1.4 percent of all casualties who were candidates for neck immobilization, before any other treatment could be rendered, or before they could be moved, might have benefited from this care. However, the risk of carrying out the immobilization maneuver in a hazardous combat environment is substantial. This is because it requires time spent under exposure to hostile fire. It was observed that 11 percent of casualties in one major engagement in Vietnam were incurred by those who were in the act of assisting another casualty. Since proper spinal immobilization requires the efforts of two people, the potential exists that the number of people exposed to hostile fire might even be doubled.(*3*)

A Navy medical officer, attached to a Marine Corps unit about to embark upon a prolonged deployment, once noted to this author that the criteria established by his superiors for the deployment readiness of hospital corpsmen dwelled predominantly upon their demonstrated proficiency in cardiopulmonary resuscitation (CPR). He remarked, "What about testing their abilities to start intravenous fluids, stop bleeding, and other tactically relevent field medical skills?" He indicated that his queries were ignored. *The unfortunate reality of combat casualty care emanating from the Vietnam experience, however, is that uncontrolled bleeding is a major cause of preventable combat deaths;* 38 percent of those killed in action bled to death from wounds that would ordinarily be controllable through simple measures. Eighty-one percent of the living wounded arrived in hospitals still bleeding from easily controllable sites as well!(*4*)

Over a decade ago, a veteran combat surgeon wrote, "When in a future war helicopters can no longer roam unfettered, we will lose the ability to evacuate the casualty immediately upon wounding. Immediate care will than once again devolve upon the casualty's combat comrade, and on the accompanying aid man. This scenario is an old one, and we had better be prepared for a rerun. Immobilized forward, the corpsman will be forced to care for chest and belly wounds, and to be responsible for initial resuscitation. Although he will have to be better trained for independent duty and, specifically for resuscitation, there will be a higher battlefield mortality, and fewer chest or large blood vessel injuries will reach a hospital alive. This gloomy picture of an immobilized casualty given less than optimal battlefield care must challenge imaginative thinking."(*5*)

How effective has our training in military specific medical practice been? Discussing his observations in Vietnam, a now retired Army Medical Corps general officer and surgeon noted, "Among reserve medical officers there was a lack of orientation concerning proper wound management. The principles of delayed primary closure (*leaving the wound open for several days after cleaning out all debris and dead tissues, a principle emanating from observations made during the Napoleonic wars*) were not understood. Many wounds were closed primarily, or if not closed primarily, were left open (*excessively*) for 2-3 weeks before secondary closure was attempted. This, together with my experience with new Army interns, convinces me that proper military surgical procedures were not being taught . . . ." He further stated, "A number of patients who had had wounds closed primarily were seen at both Clark Air Force Base Hospital and Zama Army Hospital, as the wounds had become infected and reopened. In fact, all cases seen in rear areas which had had primary closures were infected. In talking to the younger medical officers, it was evident that the principles of delayed primary suture had not been taught . . . ."(*6*)

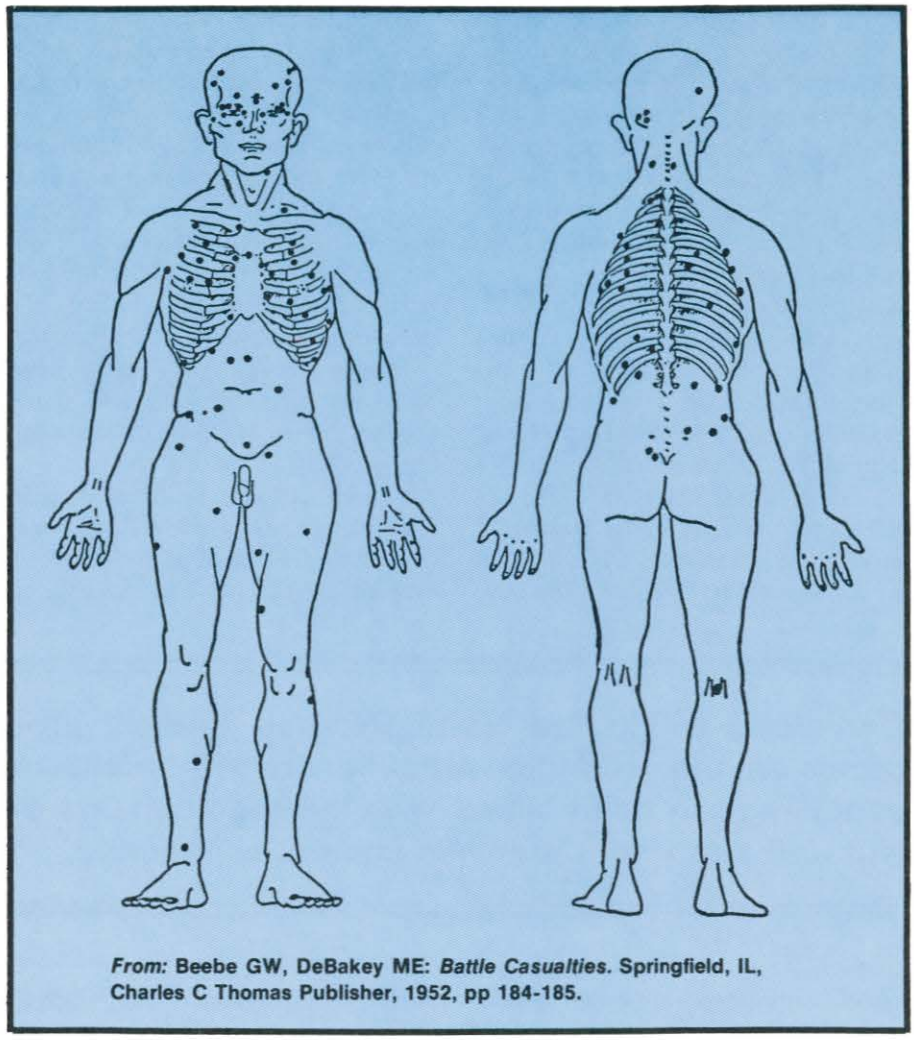
To design a realistic training format, one must look at the types of wounds actually seen in combat. In war, 60-70 percent of wounds are those of the extremities—involving soft tissues (skin and muscle), bones, blood vessels, and nerves. Examine, as well, the entrance points of those fatal wounds documented by a specially trained pathologist at the scene of the battle on Bougainville in the Pacific in WWII (Figure 1).(*7*) How many of these casualties, given updated medical care and expertise, could have been saved?

This graphic description is our challenge, for "to do better" implies that we must be able to improve upon the efforts of our forefathers among this particular group of deaths. Our training must focus upon these realities and not upon civilian trauma models. We need creative development of *relevant* educational programs and not convenient preexisting "packaged" programs. These programs must be based upon the lessons of history, an analysis of developing weapons systems, and new tactical developments—all of which will impact upon the types of injuries incurred, and the conditions under which they will be treated.

The American College of Surgeons has indicated that a competent trauma surgeon is one who has major responsibility for *at least 50 major trauma cases per year.* Let us recognize that last year there existed only one approved Level I trauma center in the entire U.S. military medical organiza-

The American College of Surgeons has indicated that a competent trauma surgeon is one who has major responsibility for *at least 50 major trauma cases per year.*

Figure 1. **Mortal wounds of entrance in 104 autopsies from wound ballistics report, Bougainville campaign, 1944.**



From: **Beebe GW, DeBakey ME:** ***Battle Casualties.*** **Springfield, IL, Charles C Thomas Publisher, 1952, pp 184-185.**

tion servicewide. Problems with trauma competence also abound in the civilian sector. A leader in U.S. trauma surgery noted, in 1985, "74.5 percent of the Chairmen of State and Provincial Committees of Trauma felt that surgeons recently appointed to medical staffs were *marginally trained* in the care of trauma patients."(*8*)

Dr. Eiseman, a leader in American surgery, noted, "Most physicians are relatively untrained even in civilian trauma. If they have had surgical training, they might have rotated through a metropolitan trauma center for a few months, where the occasional "crunch" consisted at most of three or four patients brought simultaneously to a luxuriously staffed unit. Less than 10 percent of such physicians would even have had this type of surgical background."(*2*)

It thus behooves the military services, with a legitimate vested interest in trauma training, to take a leadership role in stimulating further research and education in this most vital facet of military medical practice.

A tendency has also existed in the military to utilize other health care providers as surgical surrogates. Is this in the best interests of our wounded comrades? Two examples underline this dilemma:

• A case operated upon at Company C of the 15th Medical Battalion in the Plei Me-Pleiku action exemplifies this difficulty. "Criticism had been directed at the medical company commander for operating on an abdominal wound. A number of colon perforations were sutured primarily and replaced into the abdomen. The patient subsequently died of peritonitis. The medical officer was an obstetrician, as there were no general surgeons in the division. On questioning, this company commander stated that a major branch of the internal iliac artery was bleeding; that was the reason he operated. It was judged that this was an appropriate case for major surgery in a medical company, but because of his inexperience in general surgery he did not give appropriate treatment to the colon injury; this error resulted in the patient's death."(*9*)

Although we can readily teach representatives of other disciplines to reconnect severed intestines and blood vessels, it should be apparent that matters of judgment very often make the difference between death and survival, rather than the mere ability to carry out certain mechanical tasks, whether they be surgical or otherwise.

• A surgical consultant visited the Navy medical facility at DaNang in 1967 and noted, "Because of the shortage of the surgical staff, corpsmen were allowed and required to perform surgery on their own. They performed all the routine delayed primary closures and many debridements (*removing all dead tissue within wounds*). When I arrived in the outpatient minor surgery room of the hospital, a corpsman, alone, was debriding a through and through wound of the thigh with local anesthesia. It would seem that the performance of debridement and delayed primary closure by corpsmen, while apparently satisfactory as far as I could see, was not a desirable policy . . . ."(*10*)

What About the Reserves?

Dr. Eiseman noted, "Shamefully, the Medical Corps Reserve remained uncalled during the Vietnam decade

while unenthused civilian physicians were drafted. Illogical political reasons dictated this inefficient and grossly unfair policy. Its effects are now decimating the Medical Corps Reserve which, for lack of purpose, is withering even beyond the historic confines of peacetime shrivel. If not on first call behind the regulars in time of war, what is its purpose? Without a purpose, why should busy civilian physicians give of their time? Or, why should the country foot the bill for maintaining a Medical Corps Reserve? The Medical Corps Reserve must be on first call in a future war!"(*5*)

Several years ago, after writing an article on this subject, I was contacted by an active duty surgeon, who indicated that my recommended allocation of resources to reserve programs was wrong. He stated that the active duty side needed the resources more, since its gaps were as great or greater and certainly more meritorious. The only logical rebuttal that I could offer was that if he goes to war first and is injured—as many are who go first—I would hope that standing behind him is a reservist who knows what *he* is doing. Given the expanded responsibility of the Naval Reserve within the Fleet Hospital Program, this reality assumes even greater and more meaningful proportions.

Contained within the Naval Reserve medical programs are many medical practitioners with extensive experience in fields allied with the requirements of war and many with previous combat experience.

Contained within the Naval Reserve medical programs are many medical practitioners with extensive experience in fields allied with the requirements of war and many with previous combat experience. Deans of medical schools, chairmen of academic medical school departments, and trauma experts who both practice and teach the fundamentals of civilian trauma, participate in reserve programs. Infectious disease experts, forensic psychiatrists, and busy anesthesiologists are similar participants. Properly utilized, this potential and generally untapped "brain trust," would be of immense benefit to the evolution of a solid and meaningful definition of the requirements of military medicine. Are we in a proper mind set to utilize these assets?

Under present circumstances, Navy resources are stretched thinly around the world. Yet with the seeming propensity for the Navy to be our first national response arm in multiple crises wherever they develop, we are "force poor." This has evolved despite the Navy expansion during the Reagan-Lehman era and despite our recent emphasis upon increasing professionalism. Because of this, it is only logical to ask more of our reserve forces than we have in the past. In addition, we must be both imaginative and energetic enough to get it.

In certain Navy communities, such as naval construction and mine warfare, the program of vertical integration of the reserves with the active duty Navy is creating the basis for much expanded reserve capability. It is imperative that the reserves be given missions and tasks in which that capability will be well and fully used. We can and should define important missions against which these units can plan, train, and, when necessary, operate, rather than viewing them simply as attrition fillers to be employed in a piecemeal and haphazard fashion.

If we are to both survive and overcome the complexities of adversity that will inevitably face us in the future, we must reassess our readiness priorities and attempt to maximize the benefits obtainable from the assets available to us. As the leadership of Navy medicine continues to emerge into a more pragmatic relationship with our line colleagues, it must reexamine many issues heretofore accepted as inviolate truths and demonstrate an interest in *listening* to those voices of whispered counsel emanating from both without and within! Above all it must acknowledge that military medicine is a highly specialized discipline, and that it should be respected as an art that requires continuing and dedicated study and research. It should not be regarded as an old heirloom relegated to the attic and only dusted off and refurbished at the time of some indeterminate future conflict. Such an approach is contrary to any logical concept of readiness.

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Report From the 1989 Annual Meeting of AMA House of Delegates

Fourteen Navy physicians, lead by VADM James A. Zimble, MC, attended the American Medical Association (AMA) annual meeting, under Navy sponsorship, 18-22 June 1989 in Chicago, IL. Several other members of the Navy Medical Department represented delegations of their clinical specialty. These included RADM Robert Higgins, Alternate Delegate, American Academy of Family Physicians; Chairman, Specialty and Service Society; RADM Daniel Lestage, Representative, Section Council on Preventive Medicine (Aerospace Medical Association); CAPT Robert Margulies, Representative, Section Council on Preventive Medicine (American College of Preventive Medicine); and CDR Robert Wah, AMSUS Delegate to the Young Physicians' Section.

As a first-time attendee, I was both surprised and impressed by the workings of this forum, which is the only voting body in the United States representing the medical profession as a whole. The deliberative process used is intense, democratic, and open to the entire spectrum of concerns affecting practicing physicians. Examples of issues which were considered include economic (the impact of the Harvard RBRVS study and expenditure targets on medical practice), quality of care (the effectiveness of selected treatments), social (prohibiting tobacco use in hospitals), and educational (maximum working hours for housestaff).

The House of Delegates handles an immense load in a very short time. Resolutions are submitted in advance of the meeting (over 250) with copies provided to each delegate and alternate for study. In 2 days of Reference Committee hearings (there are eight), delegates group similar resolutions, take testimony, and "wordsmith" the original submissions into a consensus package. The house itself then meets and votes on the resolutions. Both the original resolution and the Reference Committee modification are offered for debate. Any AMA member can contribute testimony at Reference Committee hearings; only delegates may debate when the house is in session.

Prior to the House of Delegates meeting, the Medical Student and Resident Sections hold committee meetings which develop resolutions for submission to the house. Several Navy members have become quite active and influential in this area.

ENS David Lane, a second-year USUHS student, has been named to membership of student Reference Committee B.

Delegates representing professional societies can, and do, introduce resolutions which directly affect military medicine. The American College of Neurology introduced a resolution calling for increased MORB payments for military neurologists. In committee, members of the military delegations present provided input which resulted in an amended resolution, less parochial in nature. It passed readily.

Delegates showed a great deal of interest in the problems now faced by military medicine. Those of us in uniform were repeatedly questioned about limits of resourcing, now an issue affecting both the military and civilian sectors of the health care delivery system. Civilian colleagues are also interested in learning how military physicians adapt to the three-way relationship which develops among the physician, his employer, and his patient. Military physicians have lived with this system for a long time. Civilian physicians, who increasingly will work for large organizations, are experiencing a burdensome system with prior approval required for most elective admissions and procedures. At this time, the Navy physician enjoys a greater degree of freedom in determining his practice style than his civilian peer treating patients under MEDICARE.

The traditional dichotomy of the military and civilian sectors of the health care industry becomes fuzzy as the armed services increasingly develop "innovative" programs to directly utilize contracted civilian services in providing care for our beneficiaries, and begin to provide a practice environment for active duty physicians in civilian hospitals. The Navy physician is increasingly affected by the AMA's lobbying efforts and their effect on legislation and governmental policies which determine the standards by which medicine is practiced and physicians are reviewed. The delegates at this session were overwhelmingly supportive and anxious to place the considerable influence AMA enjoys behind policies which will improve the quality of care in military medicine and the quality of life for the military physician.

If you have questions concerning the AMA, or the Navy's delegate contingent, please contact me at BUMED, Medical Corps Division, Autovon 294-0926.—CAPT David G. Kemp, Alternate Navy Delegate, American Medical Association.

Quality Circles

CAPT Robert C. Moe, DC, USN

Quality Circles have been defined by Jenkins and Shimada as "small groups of employees doing similar work who voluntarily meet regularly to discuss quality problems, analyze causes, recommend solutions, and, when possible, take action themselves."(*1*)

The initial concept of Quality Circles was intended to improve quality control in industry. Reintroduced in this country by Lockheed and General Motors in the early 1970's the concept has spread at an extraordinary rate. In the past decade the number of firms using Circles has grown from a handful to hundreds. The movement has spawned an international association, a quarterly journal, and scores of consulting groups specializing in implementation of programs and training for Circle personnel.

Used in Japan after World War II as part of a scientific management methodology that focused on an objective, statistical approach, the original concept underwent considerable change by incorporating the prevailing cultural and ethical traditions of the Japanese.(*2*)

The major innovation of the Japanese, the introduction of a participative, cooperative perspective, illustrated the divergence of the Japanese and Dr. William Deming, one of the early advocates of quality control. Deming felt that managers were more responsible than workers for the quality of products; the managerial approach. The Japanese turned that concept around into a workshop-oriented quality control tool.

In a recent article Dr. Leonard wrote: "To be successful and effective, the quality process must have the active support and participation by all levels of leadership, particularly the top."(*3*)

The primary objectives of the Quality Circles approach are to utilize employees at all levels to solve problems, suggest change, and develop change methodology within organizations. This philosophy is highly participative and is intended to give employees the opportunity to become actively involved in making decisions at the level where implementation occurs.(*4*)

Since the early 1980's, a number of hospitals throughout the United States, including Mount Sinai Medical Center, Miami Beach, FL; Barnes Hospital, St. Louis, MO; and Henry Ford Hospital, Detroit, MI, have initiated the use of Quality Circles to reduce their operating expenses and enhance the quality of life for patients and hospital employees. The American Hospital Association estimated in 1984 that as many as 200 of its members then had Quality Circle programs.(*5*)

The many advantages in utilizing Quality Circles at a hospital setting have included cost savings, greater utilization of employee potential, development of unique problem-solving mechanisms, improvement of quality care and productivity, improvement in morale and job satisfaction, increased employee involvement, improvement of labor relations, and resolution of conflicts.(*6*)

Navy medical and dental clinics may be ideally suited for the Quality Circles management concept. Frequently, they are some distance from hospitals or headquarters clinics and have a staff working toward a single goal. The number of Quality Circles in each clinic is determined by the size of the staff and the clinic's professional functions. Small clinics, performing general medicine or dentistry, could well utilize the entire staff to discuss quality of care or performance problems and recommended solutions. Larger clinics with separate departments may form Quality Circle groups with volunteers from within each department.

McKinney lists six fundamental guidelines for a successful Quality Circle program, and warns against "extensive modification" from these basics:(*7*)

- Voluntary participation.
- Training in the objectives, methods, and techniques of Quality Circles.
- Scheduling Circle meetings during working hours.
- Limiting Circle problems to those affecting the immediate work area.
- Coordination of the program by a trained facilitator.
- Giving Circles the right to choose their own problems.

Management commitment is essential for success. Hospitals with Circle programs report that gaining middle management support is a major problem in implementing Quality Circle programs. Adequate time must be permitted for Quality Circle meetings and there must be a willingness to respond promptly to Circle recommendations. Department heads and clinic directors should be willing to acknowledge operational suggestions for quality of care from the subordinate levels and to commit the resources necessary for Quality Circle training and the maintenance of Circle activities.

Orlikoff suggests middle managers, i.e., department heads and clinic directors, be directly involved in the initial

implementation of Quality Circle programs and be kept informed of developments. He expresses a need for middle management training in the purposes of Quality Circles and in their proper implementation.(*8*)

The primary functions of a Quality Circle group are to identify problem areas, formulate solutions, and, where appropriate, implement corrective action. This could prove to be a stumbling block in a military clinic where the department head or clinic director may perceive this as a partial abdication of decision-making authority. Junior officers and senior enlisted personnel might hesitate to make suggestions to the clinic director in fear of appearing presumptuous or lacking in experience.

A workable situation in the military environment is one of joint decision making between the Quality Circle and management. Problem areas are identified by either the Quality Circle, the department head, or branch director. The Quality Circle then develops possible solutions which are presented to the manager/director for review.

The majority of problems investigated by the Quality Circle will usually be minor in nature and should relate directly to clinic or department operation. The Quality Circle should act as a "lightening rod" for new ideas. As such, it will function as a forum where innovative ideas regarding increased total quality care, productivity, and morale can surface without fear of ridicule or resentment.

In October 1988, a pilot Quality Circle program was initiated at the Branch Dental Clinic, Marine Corps Recruit Depot (MCRD), San Diego, a branch of the Naval Dental Clinic, San Diego, CA. With 27 officers and 56 enlisted/civilian personnel, the MCRD clinic appeared ideally suited to test the Quality Circle concept at a military facility. Adhering to McKinney's guidelines as closely as possible, seven people, representing a sampling of rank and job descriptions, were selected from volunteers for this first group.

Many ideas contributing to productivity and morale have been forthcoming. These suggestions from the ranks have been as simple as providing a picnic table for noon lunches to extending the working day into the evening hours on a volunteer basis. Changes in the military watchstanding procedures have increased morale and improved dental health care delivery during the weekends.

While all suggestions submitted by the Quality Circle group have not been implemented, all have received due consideration. After review, a decision to accept or reject a proposal from the Circle is made by the branch director. All proposals, whether accepted or rejected, are forwarded quarterly with recommendations to the commanding officer for review and comment.

The process from Quality Circle recommendation to the commanding officer's review is short in order to reinforce the feeling that the Quality Circle is a viable activity. By providing the branch director the opportunity to endorse proposals, the military "chain of command" is not circumvented. The commanding officer's review of the proposals and endorsements ensures a fair evaluation and permits the commanding officer to track the Quality Circle program.

When the pilot program was implemented some months ago, certain preconceived concepts were quickly laid to rest. It was the initial intent that the group facilitator utilize a "shadow guidance" technique, allowing the Quality Circle group to move freely in their desired directions. It was felt "too much guidance would hamper the group and stifle the input of new ideas."

In actuality, strong guidance was required in the early stages until a group identity was established and working parameters understood. After a leader from within the group has emerged and accepts a chairmanship responsibility, the facilitator can slip into the desired "shadow guidance" role.

In the early stages of the program there was a flush of anticipation by some Circle members that many long-standing naval traditions and military duties would be set aside in the name of morale or productivity upon the group's recommendation. When this did not occur, there was a period of reduced enthusiasm within the Quality Circle group. By anticipating this rise and fall in enthusiasm, the group facilitator, in the role of guide and liaison, has established a harmonious working relationship within the group and with the clinic director that is beginning to produce positive results.

The program is in its initial stages and currently undergoing evaluation. It is too early to predict the outcome. However, if initial enthusiasm among clinic personnel is an indication of success, the Quality Circle concept looks promising.

Will Quality Circles improve the total quality care and morale in the work environment of a military clinic? When the idea is fairly tested, we may discover what industry and some major hospitals have known for some time regarding quality of care and efficiency: Participative management at the lowest levels with ideas from the bottom up will contribute to quality and efficiency.

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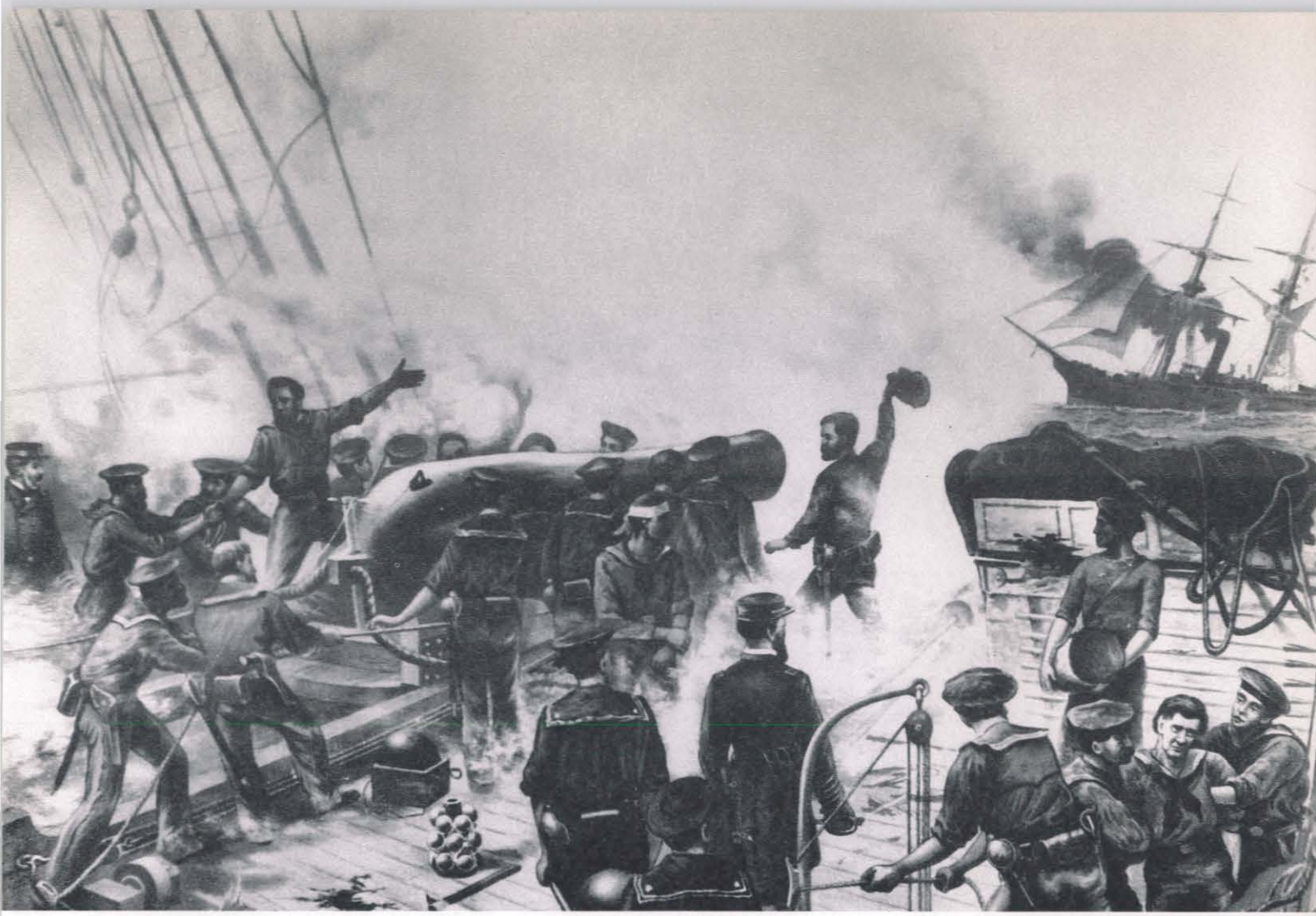

Naval Historical Center

***Kearsarge* crew cheers as CSS *Alabama* surrenders.**

Alabama's Last Stand

In November 1987, a team of French marine archaeologists located the grave of CSS *Alabama,* just months shy of the 125th anniversary of her first and last encounter with USS *Kearsarge.* In the midst of the Civil War, these two great ships battled off the coast of Cherbourg, France, on 19 June 1864, marking a memorable confrontation in the English Channel.

Alabama, under the direction of Captain Raphael Semmes, has long been considered one of the Confederacy's most successful commerce raiders during the Civil War. One British newspaper described *Alabama* as "the allegory of the confederacy itself in all but her closing scene."(*1*) *Alabama* had completed a 21-month rampage when she arrived in Cherbourg on 11 June, having destroyed or captured 69 vessels worth $6,548,000 during that time.(*2*)

Stationed off the coast of the Netherlands, the steam sloop *Kearsarge* received word that *Alabama* was cruising near the southern coast of France. Captain John A. Winslow quickly prepared his crew for the excursion south and an encounter with the Confederate ship. Winslow's vessel had been hunting *Alabama* for months but to no avail.

Acting upon a challenge from Captain Semmes, *Kearsarge* agreed to a duel on Sunday morning, 19 June. A pompous affair, the engagement attracted many people from Paris and the surrounding countryside, not unlike the way Washingtonians treated the first Battle of Bull Run; history records that many spectators showed up on that Virginia battlefield carrying full picnic baskets!

Sailors on both ships prepared themselves for battle, as one *Alabama* officer wrote, "Our men were neatly dressed, and our officers in full uniform."(*3*) Both sides fought intensely, but *Kearsarge* sank *Alabama* in just

over an hour. Captain Winslow gave a brief account of the battle:

"As we approached her, within about twelve hundred yards she opened fire, we receiving two or three broadsides before a shot was returned. The action continued, the respective steamers making a circle round and round at a distance of about nine hundred yards from each other. At the expiration of an hour the *Alabama* struck, going down in about twenty minutes afterwards, carrying many persons with her."(*4*)

The accurate firing of *Kearsarge* presented deadly results. Captain Semmes wrote, "The firing now became very hot, and the enemy's shot and shell soon began to tell upon our hull, knocking down, killing, and disabling a number of men in different parts of the ship."(*5*) A Confederate report stated casualties on *Alabama* included 9 killed, 21 wounded, and 10 drowned.(*6*)

Upon surrender, Captain Semmes begged for assistance. Two small boats from *Kearsarge* rescued several *Alabama* crewmembers, claiming 64 men and six officers as prisoners.(*7*) Captain Semmes and 41 others escaped to Southhampton, England, aboard the British yacht *Deerhound.*(*8*)

Aftermath

Aboard *Kearsarge,* the Confederate prisoners received medical treatment from Surgeon J.M. Browne, who shorthandedly rendered care to the wounded. LCDR James S. Thorton wrote that "after the action, the wounded of the enemy, numbering fifteen persons, were consigned to the care of Surgeon J.M. Browne, who was entirely without professional assistance. The duties of his department were thereby rendered extremely arduous, but were coolly and successfully performed."(*9*)

Kearsarge crewmembers miraculously survived the battle in relatively good health, as casualties included one death and two injuries.(*10*) Surgeon Browne wrote, "It is certainly surprising that the percentage should have been so small, considering the exposure and number of shots received. Probably no future similar combat will occasion like results."(*11*) William Gowin, ordinary seaman, died from complications after receiving a compound fracture of his left femur, tibia, and fibula. Another man received a compound fracture of his left tibia. John W. Dempsey, quarter gunner, received a compound comminuted fracture of his lower right arm, and according to Surgeon Browne, the arm appeared as a "shapeless mass."(*12*) A common Civil War practice, amputation of the arm followed the close of battle.

Critics have long accused Civil War surgeons of being "amputation-happy." Why had doctors made such a feeble effort to save limbs? Because statistics show that in a grossly septic environment heroic efforts seldom succeeded. Amputation was the most common surgical procedure during the war for a very good reason; the operation increased the chances of survival for a seriously wounded soldier.

In *Orthopaedics During the Civil War,* Dr. Eric Carver wrote that "primary amputation, done within 24 hours after receiving the wound, reduced the high rate of infection, saved lives from septicemia and provided a rapid, efficient means for the treatment of many thousands of casualties."(*13*) D.J. Julian Chisolm, in his *Manual of Military Surgery for the Surgeons of the Confederate States Army,* described in 1862 the terms of the procedure:

"In performance of all serious operations there should be three assistants. One aide gives the chloroform, a second compresses the main artery (tourniquets were often used) and a third holds the limb and supports the flap during the section. The aide who administers the chloroform during the incisions, can assist in ligating arteries . . . . Having assigned the aides their posts and seen that all necessary instruments which may be needed are on hand . . . the surgeon removes the limb, ligates the vessels and when all oozing has ceased, secures the stump by points of suture placed at intervals of one inch or a little less along the entire length of the wound."(*14*)

A surgeon worked quickly, usually completing an amputation within 15 minutes. As in John W. Dempsey's case, amputation was the accepted medical treatment of the war.

Kearsarge transported the wounded men to the Hospital de la Marine in Cherbourg, where they received further treatment. Surgeon Browne wrote, "It is extremely fortunate that such facilities were afforded to the injured; every care and attention were bestowed upon the unfortunates."(*15*)

Gideon Welles, President Lincoln's Secretary of the Navy, praised the *Kearsarge* crew in a letter by stating, "The battle was so brief, the victory so decisive, and the comparative results so striking, that the country will be reminded of the brilliant actions of our infant navy, which have been repeated and illustrated in this engagement."(*16*) But *Kearsarge* surgeon, J.M. Browne, must also be remembered for his dedicated work. Browne, like countless other Civil War physicians who worked in primitive conditions, delivered the best care he could render.

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Payoffs of Navy Medicine

A Quest for Purity:

Surgeon Edward R. Squibb

The surgeon knew it would be a long day. A violent Atlantic storm had kept him and his shipmates awake all night, and now he tried to clear what felt like wet wool from his head and focus on what had to be done. Three crewmen carried a limp, comatose lad into sickbay. The unfortunate man and four other sailors had been aloft taking in sail when the mast snapped. His mates were killed outright; the main hatch had broken his fall and deferred for a time the inevitable. The doctor cleansed the crushed cranial bones and administered a tiny amount of wine and water between the lips of the dying teenager. He then turned to his next patients. Three other sailors complained of a malady the doctor had diagnosed the day before as bilious remittent fever. Emetics and purgatives had been administered to "cleanse the liver of the redundancy of bile."(*1*) He hoped today's prescription of bark and other tonics would have the men back on duty in a few days.

Surgeon Edward R. Squibb

Sick call in the "old Navy" could be as frightening for the ship's surgeon as it was for the patient. In wartime the number of seamen who succumbed to shipwreck and wounds was insignificant compared to what disease wrought. A sailor's diet was responsible for many deficiency diseases with scurvy topping the list. Other maladies brought on by poor ventilation and a lack of hygiene, not to mention injuries incurred by floggings and frequent falls, gave the doctor plenty to do.

What made the job particularly disheartening was the obvious lack of quality drugs and medicines. During his 4 years aboard sailing ships of the Brazil and Mediterranean squadrons, Surgeon Edward R. Squibb was constantly appalled by the proportion of filthy, adulterated, and mislabeled drugs he was issued for use in sickbay, so much so that he was determined to do something about it.(*2*)

When Dr. Squibb joined the Navy, the Quaker community that nurtured him to adulthood may have recoiled at his renunciation of pacifism. In his own mind, however, he never abandoned the other tenets of that faith. Persistence, self-control, benevolence, and hard work forever characterized the man's quest for excellence.

After sea service as medical officer on *Perry, Erie,* and *Cumberland,* Squibb was assigned to the Naval Hospital in Brooklyn, NY. The methods available at the time for anesthesia consisted of opium, water of nightshade, henbane, lettuce, mesmerism, strapping, compression of nerve trunks, and even noise. Brandy to the point of intoxication was another method of providing relief to patients undergoing surgery.(*3*)

The need for a safe, effective, pure, and inexpensive anesthetic was obvious. Squibb found himself in a good position to provide the Navy with that anesthetic. Through his efforts, the Navy authorized him to set up a laboratory in 1852 for the production of pharmaceuticals. Devising a means of manufacturing pure ether became a priority. Squibb had noticed the tremendous variation in the effect of ether in anesthetizing patients of similar age and physique.(*4*) Why, he wondered, were some patients more difficult to put under than others? He reasoned that it had to be the purity and concentration of the ether itself. Squibb purchased as many commercial samples of ether as he could and began testing them for purity, color, limpidity, and specific gravity. As he expected, there were wide variations which he attributed to careless manufacture and the use of defective ingredients.

After a year of study, Squibb finished building his own still. What made his equipment unique was its closed steam system. Other processes utilized an open flame as a heat source, increasing the possibility of accident. Ether vapor is very explosive. Gradually, he discovered that he could wash out many of the impurities in the ether by using potassium carbonate and redistilling it. This process ensured a finished product of uniform strength and purity.

Now that he had a pure product, how should it be administered and in what dosage? Squibb monitored its use in the operating room and even invented a mask which replaced the inhaler then in use.

From the Brooklyn lab came many other important discoveries. Squibb perfected processes for manufacture of chloroform, fluid extracts, bismuth salts, calcium chloride, benzoic acid, aconite, ergot preparations, and methods for the assay of opium potent tinctures and powdered extracts.(*5*) The report of the American Pharmaceutical Association in 1857 contains an article entitled "Preparation of Ether by Steam Heat" in which Squibb described his ether apparatus.

In 1857, Squibb's laboratory closed for lack of funds when the Navy ceased its support. That year he resigned from the Navy and in 1858 founded the first Squibb chemical and pharmaceutical laboratory.

Squibb's uncompromising insistence on quality, consistent high standards, uniform labeling, and proper dosage are among his legacies. Out of a small lab in Brooklyn grew two important naval medical institutions, the Naval Medical School established in 1902 and the Naval Medical Supply Depot, and a great commercial pharmaceutical company, E.R. Squibb and Sons.

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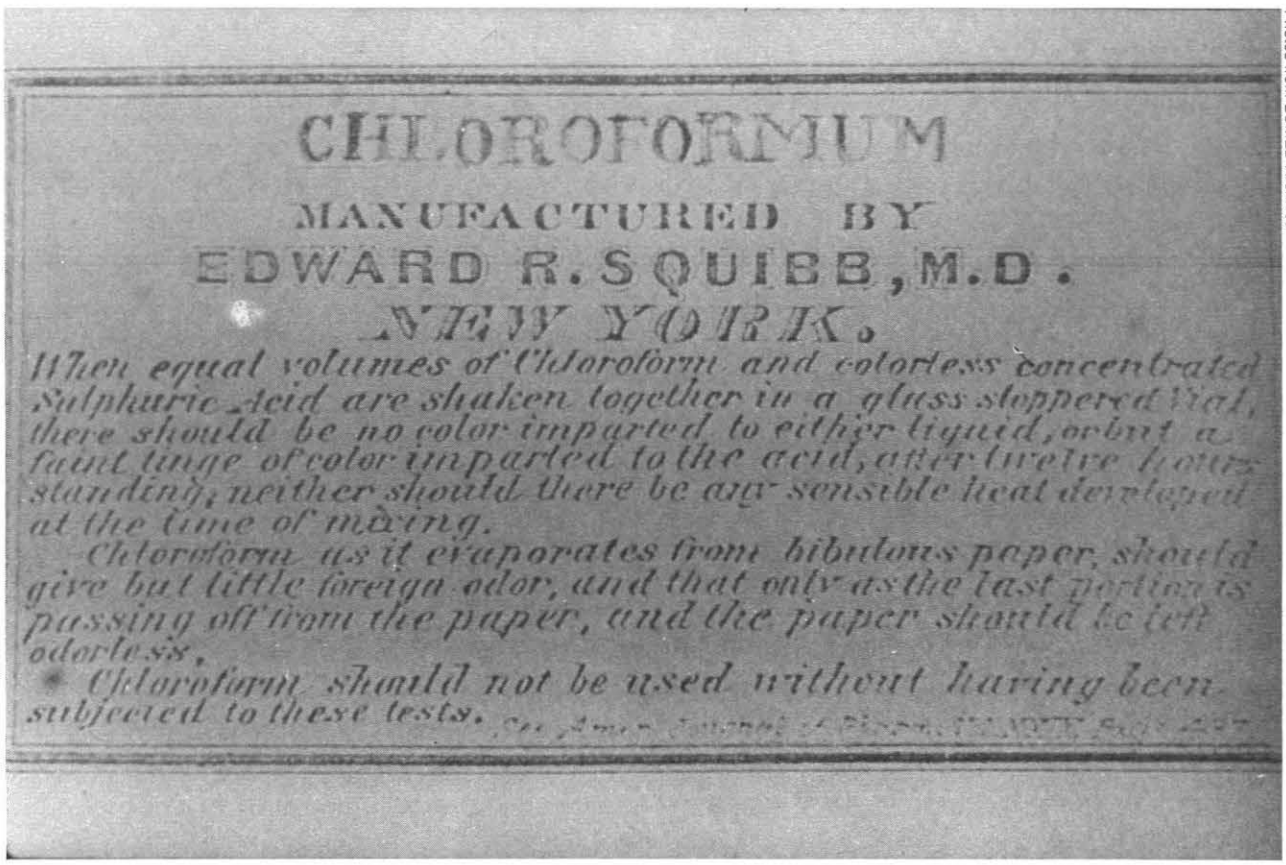

Photos from BUMED Archives

rTPA in the Emergency Therapy of Acute Transmural Myocardial Infarction

CAPT Preston L. Judson, MC, USN (Ret.)

In the following year acute myocardial infarction may be expected in 1.5 million Americans with 550,000 deaths related to myocardial infarction.(*1*) The most common etiology is atherosclerosis, and in 80 percent of cases there is present acute thrombus formation at the site of atherosclerotic plaqueing of varying degrees.(*2*)

The standard therapy of acute transmural myocardial infarction has been associated with an 11-12 percent mortality rate.(*1*) Although the concept of therapeutic lysis of the clot has long been under consideration, only since the work of Rentrop in the late 1970's has the ability of drugs to pharmacologically lyse the clot of an acute transmural infarct and provide reperfusion been repetitively demonstrated.(*3*) Well conducted randomized studies using both intracoronary and intravenous streptokinase have demonstrated a salutary and beneficial effect on reduction in mortality and improvement in left ventricular function.(*4-8*) More specifically, the studies have demonstrated an inhospital mortality decrease from 11 percent to approximately 5 percent with the therapeutic modality of clot lysis.(*8*)

Until recently, lytic therapy has been hampered by FDA approval for only intracoronary streptokinase which is time consuming and of limited availability to patients. Although the efficacy of recanalization from intravenous streptokinase has been somewhat controversial, it has generally been accepted that it is not as effective as intracoronary streptokinase.(*9*) Therefore, although lytic therapy has been established as a valuable therapeutic approach early during the evolution of an acute transmural myocardial infarction, its accessability for patient care has been restricted.

Recombinant DNA technology has permitted the development of rTPA (recombinant tissue-type plasminogen activator). The recent release of this drug has yielded a significant and important pharmacologic modality which is a first-line therapeutic agent for lysis of thrombus during the early stages of evolution of an acute transmural myocardial infarction.(*10,11*) The TIMI (thrombolysis in myocardial infarction) investigators have demonstrated 90-minute reperfusion rates of 66 percent with intravenous rTPA identical with those of intracoronary streptokinase and twice as effective as intravenous streptokinase.(*9,11*) rTPA is FDA-approved for therapy of acute myocardial infarction. Although controlled survival studies with rTPA have not been performed, improved survival has been readily demonstrated with a prior analysis of thrombolytic therapy.(*4-7*)

The current rTPA survival rates during hospitalization indicate a low mortality of approximately 5 percent.(*11,12*) Although initially developed as selective for fibrin desolution, the drug does produce a partial systemic lytic state. Fibrinogen levels are not as depressed as with streptokinase. There has been noted a 5 percent occurrence of GI bleeding in the initial phases of rTPA evaluation.(*10*) At higher doses a 1.5 percent incidence of CNS hemorrhage was recognized, and with dose reduction to 100 mg evidence shows a 0 to .4 percent occurrence of intracranial bleeding(*12*) which is well within the expected range of spontaneous CNS bleeding during an acute myocardial infarction.(*10,12*) The majority of bleeding complications with rTPA in the advised dose range are associated with deep needle puncture sites and associated hematoma formation.(*10*) An 11 percent reocclusion rate characterized by recurrence of chest pain and/or EKG changes is of clinical concern.(*9*) Therefore, the efficacy and safety of rTPA are well established.

As implied above, the earlier the administration of rTPA the higher the patency rate, the greater the LV salvage, the lower the mortality, and also the greater the need for subsequent early (within 24-48 hours) evaluation of the patient for coronary artery anatomy and possible consideration for alternative interventions as balloon angioplasty or bypass surgery on a delayed 2-day to 3-week interval.(*11-14*) As soon as clinically feasible and cardiovascularly stable, these patients should be in a center where cardiac catheterization facilities are available.(*13,14*)

Drug Protocol

The following patients will be eligible for consideration for rTPA administration: less than 75 years of age, chest pain characteristic of myocardial infarction lasting for greater than 30 minutes and not relieved by sublingual nitroglycerin, electrocardiographic ST segment elevation of greater than .1 millivolts over baseline in at least 2 contiguous leads, and time from onset of ischemia to initiation of therapy less than 4 hours.

Absolute contraindications to administration of rTPA are: history of any prior cerebrovascular event, intracranial neoplasm, AV malformation, hemorrhage or stroke, past or present bleeding diathesis or hemorrhagic disorder, recent (within 2 months) intracranial or spinal surgery or trauma, uncontrolled hypertension with systolic pressures of greater than 180 mm Hg and diastolics greater than 110 mm Hg, recent (within past 2 weeks) significant surgical procedure, serious advanced diseases, incurable or metastatic malignancy, and recent major surgery of noncompressible site including coronary bypass surgery and intra-abdominal surgery.

Relative risk factors of a minor nature to be noted but not a contraindication to administration of rTPA include recent puncture of a noncompressible vessel, diabetic hemorrhagic retinopathy, and other hemorrhagic ophthalmologic conditions.

Procedure

Upon initial presentation the basic laboratory studies of a CBC, SMA 18, PT, PTT, platelet count, cardiac enzymes, and isoenzymes should be obtain. Therapy should not be delayed by waiting for the results of any of these studies. Appropriate IV access lines should be established. The patient should be on rhythm monitoring, and appropriate 12 lead electrocardiogram should have been obtained. rTPA is supplied in 50 mg vials and the two vials should be reconstituted in 50 cc of sterile water each. After reconstitution, the rTPA may be diluted up to 1:2 in normal saline or D5W. A separate IV infusion line should be utilized for rTPA. Appropriate xylocaine infusion is suggested. The rTPA may be administered as an initial 10 mg IV bolus followed by 50 mg IV over the first 1 hour and then 40 mg IV over 2 subsequent hours for a total dose of 100 mg. IV apparatus and tubing should be flushed intravenously at the completion of rTPA therapy to ensure total drug administration. Heparin therapy should be instituted during the first hour of initial rTPA infusion with an initial bolus of 5,000 units of IV heparin followed by 1,000 units per hour and adjusted to maintain a PTT at 1.5 to 2 times control. Appropriate laboratory monitoring of PT, PTT, cardiac enzymes, and EKG's should be undertaken with the patient placed on standard cardiac monitorings and therapy for myocardial infarction. Unnecessary arterial and venous punctures should be avoided and, if necessary, locally compressed for 30 minutes with subsequent pressure dressing applied. Deep internal jugular and subclavian punctures should be completely avoided unless absolutely necessary. Unexpected central line access is best obtained by other transfemoral route or by venous cutdown approach. Treatment results will be assessed by chest pain resolution and resolution of EKG changes. Reocclusion may be treated with repeat rTPA with 70 mg IV over 1 hour. Angiography evaluation is to be undertaken at the discretion of the attending physician but is generally encouraged within the first 48 hours of admission, or if there is evidence of instability in the postinfarct course, or evidence of reocclusion, or recurrence of ischemia.

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